$S \to SS \mid aSb \mid \varepsilon$

aababb

$S \to \boxed{aSb} \to aSSb \to$

$aaSbSb \to aabSb \to$

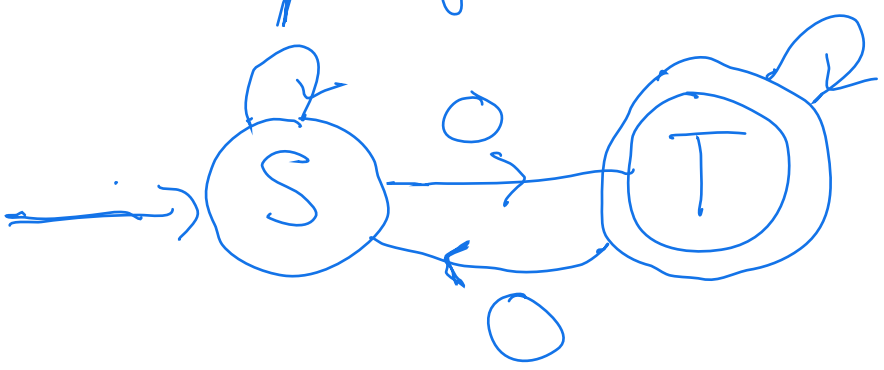
$aabaSbb \to \underline{aababb}$

$S \to SS \to \boxed{aSb}S$ Now repeat same steps of previous derivation

$aSbS \to \cdots \to aababbS \to$

$\boxed{aababb}$

Example: Provide a CFG for the CFL consisting of all binary words having an odd # of 0's.



$V = \{S, T\}$ $\Sigma = \{0, 1\}$ S ↑ start

R:

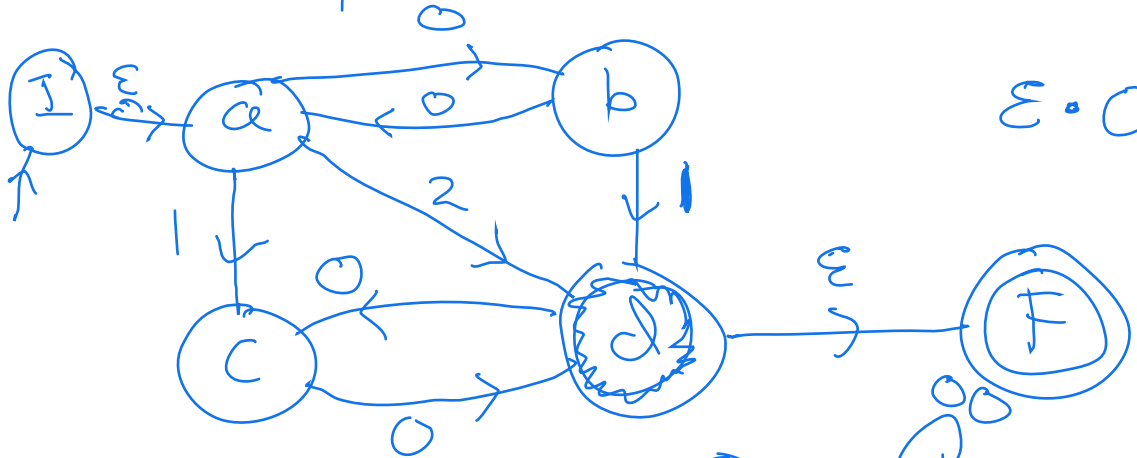
$$S \to 1S \mid 0T$$
$$T \to 1T \mid 0S \mid \varepsilon$$

Derive 0010.

$S \to 0T \to 00S \to 001S \to$

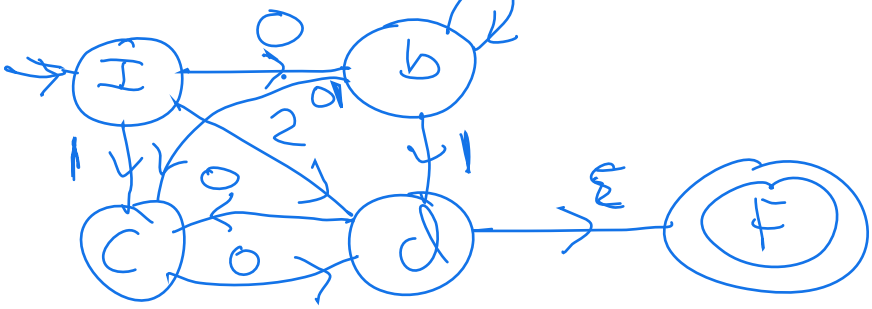
$0010T \to$ 0010

Example. Convert to a Reg. Expression

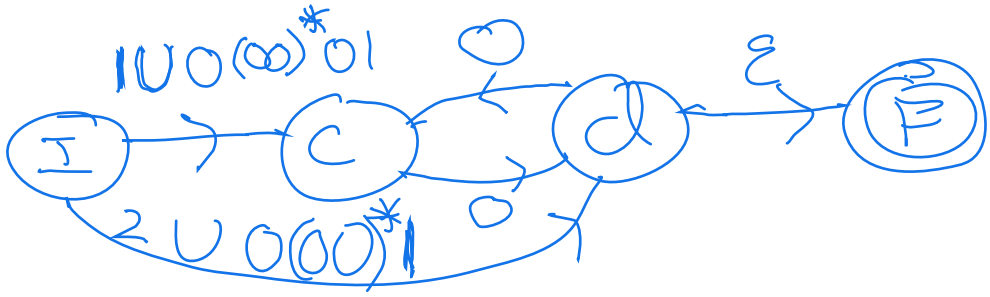


$\varepsilon \cdot 0 = 0$

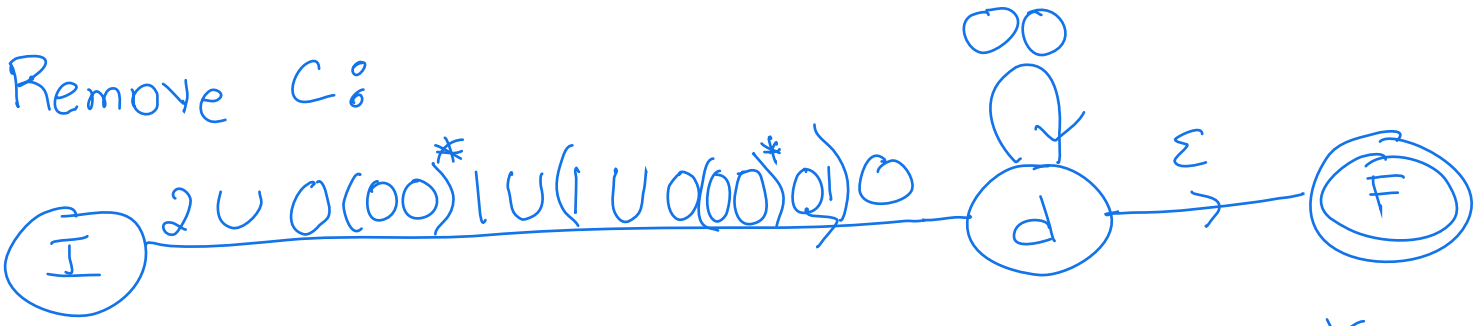
Remove a:



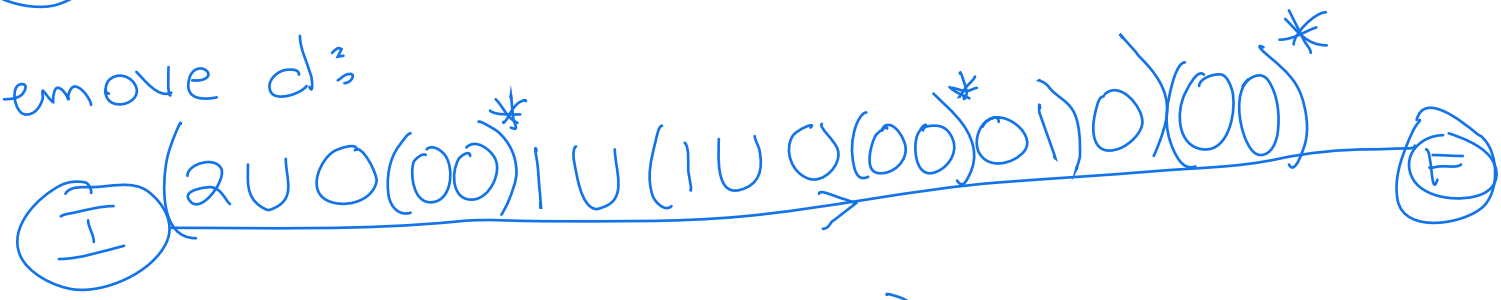
Remove b:



Remove c:



Remove d:



Final Expression (simplified)

$$2(00)^* \cup 0(00)^*1(00)^* \cup 10(00)^*$$

$$\cup\ 0(00)^*01(00)^*$$

In words: "begin with 2 and has an even # of 0's or exactly one 1 and an odd # of 0's"